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A NEW SPECIES OF FOSSIL GAVIAL FROM THE SIWALIK BEDS[1]

BY CHARLES C. MOOK

Among the fossil vertebrates collected by Barnum Brown from the sediments of the Siwalik formation in 1922, is a well-preserved gavialoid crocodilian skull. This skull is practically complete, except for the premaxillary region, which is missing. Its horizon is lower middle Siwalik, which makes it Lower Pliocene, according to Dr. Matthew's 1929 correlation (p. 441, fig. 1). Ten teeth are preserved, and the alveoli of nearly all of the rest in the portion of the skull preserved are clearly indicated. The locality is one mile south of Nathot, India.

The characters of this skull indicate that it belonged to a species quite distinct from the living gavial of the Gangetic region (*Gavialis gangeticus*), from the various Siwalik species of gavials described by Falconer, Cautley, and Pilgrim, and from *G. dixoni* Owen, of the Eocene of Europe. Comparison with *G. bahiensis* Marsh is not possible at the present time. This species is given the name *Gavialis browni* in honor of Mr. Brown, who collected the type skull.

Gavialis browni, new species

TYPE.—Amer. Mus. 6279. Skull with ten teeth, practically complete except for the premaxillary region, which is missing.

TYPE LOCALITY AND LEVEL.—One mile south of Nathot, India. Lower part of the middle Siwalik beds. Lower Pliocene.

TYPE CHARACTERS.—Skull gavialoid but more massive in construction than is usual in *Gavialis*. Teeth relatively strong and far apart. Palatine fenestræ long and narrow. Orbits relatively close together. Supratemporal fenestræ broad in proportion to their length. Supraoccipital bone does not appear on dorsal surface of skull. Nasal bones relatively long and narrow.

DESCRIPTION.—The sutures on the superior surface of the skull are fairly clear. The prefrontals occupy relatively less of the orbital border in this species than they do in the modern gavial, and the lachrymal has a relatively longer contact with the nasals. Ten alveoli lie opposite or posterior to the anterior end of the nasals on each side. In the skull of living *G. gangeticus* compared (of about the same size) there are eleven. The nasal bones are narrower in the fossil form, *G. browni*.

On the palate the maxillo-palatine sutures are obscure, but they appear to extend farther forward than in the living gavial. In the latter, *G. gangeticus*, the distance

[1]Contributions to the Osteology, Affinities, and Distribution of the Crocodilia. No. 23.

Fig. 1. *Gavialis browni*, new species. Type, Amer. Mus. No. 6279. Skull. One-fifth natural size.

A, lateral view, right side, B, superior view.

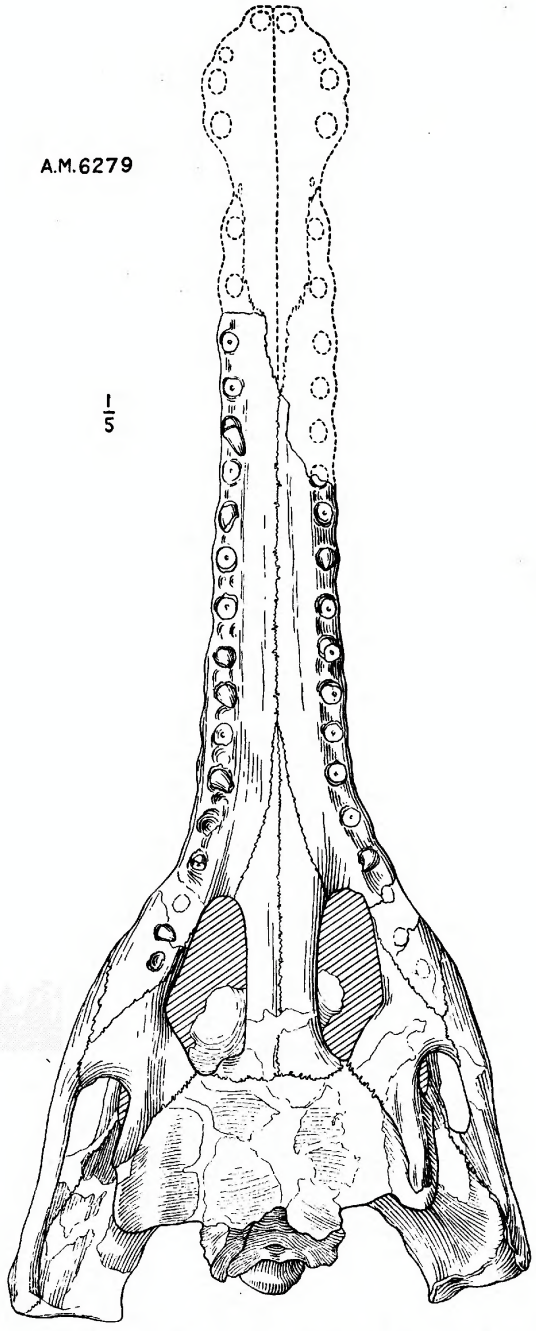

Fig. 2. *Gavialis browni*, new species. Type, Amer. Mus. No. 6279. Skull. One-fifth natural size.
Inferior view.

from the anterior ends of the palatine fenestræ forward to the junction of the two maxillo-palatine sutures at the median line, measured along the median line, is considerably less than the breadth of the palate at this junction. In *G. browni* this distance along the median line is considerably greater than the breadth of the palate.

The palatine fenestræ of the fossil specimen, *G. browni*, are much longer, and relatively much narrower than in the living gavial. In the fossil specimen the length of either fenestra is about one and one-third times the length of the pterygoids. In *G. gangeticus* the fenestræ are equal in length to the pterygoids.

Fossil gavial specimens from the Siwalik formation have been described by Falconer and Cautley as *Gavialis leptodus* and *Rhamphosuchus crassidens*, and by Lydekker and Pilgrim as *Gavialis hysudricus*, *G. curvirostris*, *G. pachyrhynchus*, *G. curvirostris* var. *gajensis*, and *G. breviceps*. The new species, *G. browni*, has been compared with figures of all these and differs from all except *R. crassidens* in having the teeth, or their alveoli, farther apart in proportion to the breadth of the snout. It is difficult to make a satisfactory comparison with *R. crassidens*, as few corresponding parts are preserved in the type, and those that are so preserved are not especially significant. It appears that in *R. crassidens* the snout is deeper vertically, also its horizon is somewhat higher than in the new species.

In *Gavialis dixoni* Owen, from the Eocene of England, the snout is narrower, and the alveoli are spaced farther apart than in the new Siwalik species. The latter is almost intermediate in this respect between *G. dixoni* on the one hand and the previously described Siwalik gavials on the other.

CONCLUSIONS

This new species, *Gavialis browni*, represents a previously unknown stage in the evolution of the gavials. The direction of specialization in the gavials has been to increase the length of the snout, to multiply the number of teeth, to decrease the size of the teeth, and to bring them closer together. *G. dixoni* represents a primitive stage in this process, *G. browni* a slightly more advanced stage; the species of gavials described by Falconer and Cautley, and by Lydekker represent highly specialized stages, and the modern gavial is the culminating stage. Opinion as to the exact phylogenetic relations of the various species of gavials is reserved for the present.

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